

CLAIMS

1. An apparatus for moving a body, wherein a phantom axis passing a head to a center of legs of the body is defined as a vertical axis, a phantom axis passing an abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these three axes are carried out individually or in combination.
2. An apparatus for moving a body, wherein a phantom axis passing a head to a center of legs of the body is defined as a vertical axis, and a phantom axis passing an abdomen in the longitudinal direction is defined as a longitudinal axis, and motions around these two axes are carried out individually or in combination.
3. An apparatus for moving a body, wherein a phantom axis passing a head to a center of legs of the body is defined as a vertical axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these two axes are carried out individually or in combination.
4. An apparatus for moving a body, wherein a phantom axis passing an abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these two axes are carried out individually or in combination.
5. An apparatus for moving a body, wherein a phantom axis passing a top of a head to soles of legs of the body standing upright or lying face up or down is defined as a vertical axis, a phantom axis passing an abdomen in the longitudinal direction

is defined as a longitudinal axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these three phantom axes are regularly carried out.

6. An apparatus for moving a body, wherein a phantom axis passing a top center of a head to a center of soles of legs of the body standing upright or lying face up or down is defined as a vertical axis, a phantom axis passing a bendable abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the bendable abdomen in the lateral direction is defined as a lateral axis, and a turning motion around said vertical axis, a laterally swinging motion around said longitudinal axis and a lying up and down motion around said lateral axis are combined.

7. An apparatus for moving a body, wherein a phantom axis passing a top center of a head to a center of sitting posture of the sitting body is defined as a vertical axis, a phantom axis passing an abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these three phantom axes are regularly carried out.

8. An apparatus for moving a body, wherein a phantom axis passing a top center of a head to a center of sitting posture of the sitting body is defined as a vertical axis, a phantom axis passing a bendable abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the bendable abdomen in the lateral direction is defined as a lateral axis, and a turning motion around said vertical axis, a laterally swinging motion around said longitudinal axis, and

a lying up and down motion around said longitudinal axis are combined.

9. An apparatus for moving a body, wherein a phantom axis passing through a head to a center of legs of the body is defined as a vertical axis, a phantom axis passing through an abdomen surface to a back surface in a longitudinal direction is defined as a longitudinal axis, and a phantom axis passing through a body side surface in a lateral direction is defined as a lateral axis, a rotating motion around said vertical axis based on at least one origin from a lumbar vertebrae, a chest thoracic vertebrae and a cervical vertebra, a laterally swinging motion around a phantom axis in which a position of said longitudinal axis is at least one point from a loin to a chest and cervix, and a lying up and down motion around a phantom axis in which a position of said lateral axis is at least one point from the loin to the chest and the cervix, are carried out individually or in combination.

10. An apparatus for moving a body according to claim 9, wherein when at least two of said turning motion, said laterally swinging motion and said lying up and down motion are carried out continuously, a position of an origin of said vertical axis, a position of said longitudinal axis and a position of said lateral axis are fixed or moved.

11. A bed for moving a body using an apparatus for moving a body described in any one of claims 1 to 10.

12. A body adjusting method, wherein a phantom axis passing a head to a center of legs of the body is defined as a vertical axis, a phantom axis passing an abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis

passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these three axes are carried out individually or in combination, and the method adjusts the body so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

13. A body adjusting method, wherein a phantom axis passing a top of a head to soles of legs of the body standing upright or lying face up or down is defined as a vertical axis, a phantom axis passing an abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and a motions around these three phantom axes are regularly carried out so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

14. A body adjusting method, wherein a phantom axis passing a top center of a head to a center of soles of legs of the body standing upright or lying face up or down is defined as a vertical axis, a phantom axis passing a bendable abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the bendable abdomen in the lateral direction is defined as a lateral axis, and a turning motion around said vertical axis, a laterally swinging motion around said longitudinal axis and a lying up and down motion around said lateral axis are combined so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

15. A body adjusting method, wherein a phantom axis passing a top center of a head to a center of sitting posture of the sitting body is defined as a vertical axis, a phantom axis passing an abdomen in the longitudinal direction is defined as a

longitudinal axis, and a phantom axis passing the abdomen in the lateral direction is defined as a lateral axis, and motions around these three phantom axes are regularly carried out so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

16. A body adjusting method, wherein a phantom axis passing a top center of a head to a center of sitting posture of the sitting body is defined as a vertical axis, a phantom axis passing a bendable abdomen in the longitudinal direction is defined as a longitudinal axis, and a phantom axis passing the bendable abdomen in the lateral direction is defined as a lateral axis, and a turning motion around said vertical axis, a laterally swinging motion around said longitudinal axis, and a lying up and down motion around said lateral axis are combined so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

17. A body adjusting method, wherein a phantom axis passing through a head to a center of legs of the body is defined as a vertical axis, a phantom axis passing through an abdomen surface to a back surface in a longitudinal direction is defined as a longitudinal axis, and a phantom axis passing through a body side surface in a lateral direction is defined as a lateral axis, a rotating motion around said vertical axis based on at least one origin from a lumbar vertebrae, a chest thoracic vertebrae and a cervical vertebra, a laterally swinging motion around a phantom axis in which a position of said longitudinal axis is at least one point from a loin to a chest and cervix, and a lying up and down motion around a phantom axis in which a position of said longitudinal axis is at least one point from the loin

to the chest and the cervix, are carried out individually or in combination so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

18. A body adjusting method according to claim 17, wherein a turning motion around said vertical axis having an origin which is at least one of the loin, the chest and cervix, a laterally swinging motion around a phantom axis having a position of said longitudinal axis which is at least one of the loin, the chest and cervix, and a lying up and down motion around a phantom axis having a position of said longitudinal axis which is at least one of the loin, the chest and cervix, are carried out individually or in combination, and when two or more of said body motions are carried out continuously, a position of said origin of said vertical axis, a position of said longitudinal axis and a position of said lateral axis are fixed or moved every time, so that distortion or unbalance of the body is eliminated, circulation of blood is promoted, and the body is relaxed.

19. An adjusting apparatus for carrying out a body adjusting method described in any one of claims 12 to 18.

20. A bed having a bottom which is divided into a plurality of members and in which the divided members can move such as to form different slants, wherein said bed includes swinging mechanism means for giving a twisting motion to at least one of said members of said bottom.

21. A bed according to claim 20, wherein the member of said bottom to which the twisting motion is given by said swinging mechanism means is a back rising bottom for supporting a back.

22. A bed according to claim 20 or 21, wherein an inclination

angle of a back rising bottom for supporting a back can be changed.

23. A bed according to claim 20, wherein the member of said bottom to which the twisting motion is given by said swinging mechanism means is a leg rising bottom for supporting a leg.

24. A bed according to claim 20 or 23, wherein an inclination angle of a leg rising bottom for supporting a leg can be changed.

25. A bed having a bottom which is divided into a plurality of members and in which the divided members can move such as to form different slants, wherein at least one of the members of said bottom constitutes a back rising bottom, at least one of the members of said bottom constitutes a leg rising bottom, and inclination angles of said back rising bottom and leg rising bottom can be changed.

26. A bed according to claim 25, wherein at least two of the members of said bottom constitute the leg rising bottom, and at least two of the members constituting the leg rising bottom form a mountain-like slant such as to bring a knee of a body.

27. A bed according to claim 25, further comprising back rising driving means for changing the inclination angle of said back rising bottom, and leg rising driving means for changing the inclination angle of said leg rising bottom.

28. A bed according to claim 27, wherein said back rising driving means changes an inclination angle of said back rising bottom while twisting the back rising bottom.

29. A bed according to claim 27, wherein said leg rising driving means changes an inclination angle of said leg rising bottom while twisting the leg rising bottom.

30. A bed according to claim 27, further comprising display means for displaying a twist angle or inclination angle of said

back rising bottom or said leg rising bottom.

31. A bed according to claim 27, further comprising an operating portion for controlling a driving operation of said back rising driving means and said leg rising driving means.

32. A bed according to claim 27, further comprising storing means for storing a twist angle or an inclination angle of said back rising bottom or said leg rising bottom.

33. A bed comprising a bottom which is divided into a plurality of members which can move such as to form different slants, a body motion detector for detecting a motion of a body existing on said bottom, sleeping state judging means for judging a sleeping state by a signal from said body motion detector, driving means for moving at least one member of said bottom, and driving control means for controlling a driving of said driving means, wherein said driving control means controls the driving of said driving means by a signal from said sleeping state judging means.

34. A bed according to claim 33, wherein said driving control means moves said driving means after a predetermined time is elapsed from an instant when said driving control means received a sleeping state completion judging signal from said sleeping state judging means.

35. A bed according to claim 33, wherein if said driving control means received a sleeping state judging signal from said sleeping state judging means, said driving control means allows said driving means to move such as to return the back rising bottom and the leg rising bottom to a horizontal state or an inclination state which was previously set as a slant in the sleeping state.

36. A bed comprising a bottom which is divided into a plurality of members which can move such as to form different slants, a

twisting driving means for twisting at least one of the members of said bottom, a plurality of load sensors for detecting weights of portions of a body existing on said bottom, a plurality of output means for outputting a detection signal detected by said load sensor, and comparing means for comparing output signal value from said output means, wherein said twisting driving means twists at least one of the members of said bottom based on a comparison signal from said comparing means.

37. A bed comprising a bottom which is divided into a plurality of members which can move such as to form different slants, a driving means for moving at least one of the members of said bottom, a load sensor for detecting a weight of a body existing on said bottom, output means for outputting a detection signal detected by said load sensor, and a time setting means for setting a predetermined time, wherein when a signal is not output from said output means within time set by said time setting means, this state is judged as a sleeping state, and an output signal from said driving means is changed.

38. A bed according to claim 37, wherein when a signal is not output from said output means within time set by said time setting means, a motion state is released, or the state is returned to a state which was previously set as a sleeping state.

39. A bed comprising a bottom which is divided into a plurality of members which can move such as to form different slants, a twisting driving means for moving at least one of the members of said bottom, and timer means for setting a predetermined time, wherein after time set by the timer means was elapsed, an output signal from said driving means is changed.

40. A bed according to claim 39, wherein after time set by

the timer means was elapsed, a motion state is released, or the state is returned to a state which was previously set as a sleeping state.

41. A bed comprising a bottom which is divided into a plurality of members which can move such as to form different slants, a driving means for moving at least one of the members of said bottom, a load sensor for detecting a weight of a body existing on said bottom, output means for outputting a detection signal detected by said load sensor, and weight judging means for judging whether there is a body based on a signal from said output means, wherein when the existence of said body can not be confirmed by said weight judging means, said driving means is not moved.

42. A bed according to claim 41, further comprising weight setting means for storing weight of a bed user, wherein said weight judging means judges the bed user from a weight detected by said load sensor and a weight set by said weight setting means, and when said weight judging means can not confirm the bed user, said driving means is not moved.

43. A bed comprising a bottom divided into a plurality of members, twisting mechanism means for twisting a back rising bottom supporting a back of said bottom, a plurality of load sensor disposed between legs of said bottom and a floor surface, weight judging means for calculating a weight of each portion based on a detection signal detected by said load sensors, weight comparing means for comparing weights of portions calculated by said weight judging means, deviation amount converting means for converting a weight difference obtained by comparison of said weight comparing means into a deviation amount with respect to a center of said bed, twisting motion correcting means for

correcting a twisting amount based on said deviation amount, and driving means for driving said twisting mechanism means based on twist motion corrected by said twisting motion correcting means.

44. A bed driving method having a back rising bottom for supporting a back, wherein said back rising bottom is vertically moved in a predetermined angle range with respect to a horizontal plane while twisting said back rising bottom.

45. A bed driving method according to claim 44, wherein a twist motion and a vertical motion given to said back rising bottom are carried out in predetermined rhythm.

46. A bed driving method according to claim 44, wherein a twist motion given to said back rising bottom is carried out twice or less/second.

47. A bed driving method according to claim 44, wherein a twist motion given to said back rising bottom is carried out at an angle of 15° or more at maximum with respect to a horizontal plane, and a vertical motion is carried out at an angle of 5° at maximum with respect to the horizontal plane.

48. A bed driving method according to claim 44, wherein a twist motion and a vertical motion given to said back rising bottom are repeatedly carried out while setting a maximum variation of one time is equal to or less than 10° .

49. A bed driving method according to claim 44, wherein a twist motion given to said back rising bottom is carried out at an angle of 20° or less with respect to a horizontal plane, and a vertical motion is carried out at an angle of 20° or less with respect to the horizontal plane.

50. A bed driving method according to claim 44, wherein a twist

motion given to said back rising bottom is carried out at a speed of twice or less/second for a predetermined time and then, the twist motion is carried out at a speed higher than twice/second.

51. A bed driving method according to claim 44, wherein a twist motion given to said back rising bottom is carried out while gradually increasing speed from twice or less/second to twice or more/second.

52. A bed driving method according to claim 44, wherein an angle of a twist motion with respect to a horizontal plane and an angle of a vertical motion with respect to a horizontal plane are gradually increased.

53. A bed driving method according to claim 44, wherein a twist motion and a vertical motion given to said back rising bottom are carried out at different timings.

54. A bed driving method having a back rising bottom for supporting a back, wherein said back rising bottom is brought upward through a predetermined angle and then, said back rising bottom is lowered while twisting said back rising bottom.

55. A bed driving method according to claim 54, wherein said predetermined angle for bringing said back rising bottom upward is 20° or more with respect to a horizontal plane.

56. A bed driving method according to claim 54, wherein said back rising bottom is repeatedly brought upward and downward.

57. A bed driving method having a back rising bottom for supporting a back and a leg rising bottom for supporting a leg, wherein said back rising bottom and said leg rising bottom are brought upward through a predetermined angle and then, said back rising bottom and said leg rising bottom are lowered while twisting said back rising bottom.

58. A bed driving method according to claim 57, wherein a total of said predetermined angle for bringing said back rising bottom and said predetermined angle for bringing said leg rising bottom with respect to a horizontal plane is 20° or more.

59. A bed driving method according to claim 57, wherein said back rising bottom and said leg rising bottom are repeatedly brought upward and downward.

60. A bed driving method according to any one of claims 44 to 59, wherein a speed for bringing said back rising bottom upward or downward can be selected from preset speeds, or can be set in a preset speed range.

61. A bed driving method according to any one of claims 57 to 59, wherein a speed for bringing said leg rising bottom upward or downward can be selected from preset speeds, or can be set in a preset speed range.

62. A bed driving method according to any one of claims 44 to 59, wherein an angle for bringing said back rising bottom upward or downward can be selected from preset angles, or can be set in a preset angle range.

63. A bed driving method according to any one of claims 57 to 59, wherein an angle for bringing said leg rising bottom upward or downward can be selected from preset angles, or can be set in a preset angle range.

64. A bed driving method having a back rising bottom for supporting a back or a leg rising bottom for supporting a leg, wherein said back rising bottom or said leg rising bottom is rotated through a predetermined angle around a phantom longitudinal axis passing an abdomen of a body lying on a bed in a longitudinal direction.

65. A bed driving method according to claim 64, wherein a rotation angle or a rotation direction of said back rising bottom or said leg rising bottom can be selected from preset angles, or can be set in a preset angle range.

66. A bed driving method having a back rising bottom for supporting a back and a leg rising bottom for supporting a leg, wherein said back rising bottom and said leg rising bottom carry out a twist motion around a phantom vertical axis passing through a head and a center of legs of a body lying on a bed, a turning motion around a phantom longitudinal axis passing through an abdomen of the body lying on the bed in a longitudinal direction, and a vertical motion around a phantom lateral axis passing through the abdomen of the body lying on the bed in a lateral direction, a plurality of motion patterns comprising said twist motion, said turning motion and said vertical motion individually or in combination are previously set, the order of these motion patterns is changed, or a speed, an angle or a direction of each of said motion patterns can be changed.

67. A bed operating apparatus comprising a box-like outline, operation will detecting means provided on at least one surface of said outline for detecting operation will, operation content detecting means provided on at least one surface of said outline for detecting operation content, and operation instruction determining means for outputting said operation content when operation will is detected by said operation will detecting means and operation content is detected by said operation content detecting means.

68. A bed operating apparatus according to claim 67, wherein said operation will detecting means is provided on each of two

opposed side surfaces of said outline.

69. A bed operating apparatus according to claim 67, wherein said operation will detecting means and said operation content detecting means are provided on different surfaces of said outline.

70. A bed operating apparatus according to claim 67, further comprising display means for displaying the operation content or motion state of the bed, and illumination changing means for changing illumination of said display means, wherein said illumination changing means changes illumination to high level as compared before the operation will is detected, when the operating will is detected by said operation will detecting means.

71. A bed operating apparatus according to claim 70, wherein after a predetermined time was elapsed from an instant when the operating will was detected by said operation will detecting means, or after a predetermined time was elapsed from an instant when the operating will was not detected by said operation will detecting means, or when the operating will was not detected by said operation will detecting means, the illumination is changed to low level.

72. A bed operating apparatus according to claim 70 or 71, wherein said illumination is gradually changed.

73. A bed driving apparatus comprising storing means which previously stores moving positions of target portions and reaching time to each of the moving positions as target values, driving means for moving said target portions, and position detecting means for detecting motion positions of the target portions by said driving means, wherein the motion positions detected by said position detecting means are brought into

synchronism with target values previously stored, said target values are sequentially read out, each detected motion position and each target value are compared to drive said driving means.

74. A bed driving apparatus comprising storing means which previously stores moving positions of target portions and reaching time to each of the moving positions as target values, driving means for moving said target portions, and position detecting means for detecting motion positions of the target portions by said driving means, wherein the motion positions detected by said position detecting means are brought into synchronism with target values previously stored, said target values are sequentially read out, generated target values which are continuous are calculated per unit time which is previously determined by position information between two continuous target positions, the detected motion position and each generated target value are compared to drive said driving means.

75. A bed driving apparatus according to claim 73 or 74, wherein when said driving means is started or stopped, voltage to be applied to said driving means is stepwisely changed based on preset arbitrary acceleration variation value.

76. A bed driving apparatus according to claim 73 or 74, wherein when a difference between said target value and a detected moving position exceeds a preset excessive load detection difference value, this state is judged as an excessive load state.

77. A bed driving apparatus according to claim 73 or 74, wherein when a difference between said target value and a detected moving position exceeds a preset sandwiching detection difference value, this state is judged as a sandwiching state.